Subclavian carotid transposition and bypass grafting: consecutive cohort study and systematic review


Authors' objectives
To carry out a systematic review in order to compare the outcomes of subclavian carotid transposition (SCT) and carotid subclavian bypass grafting (CSBG) for reconstruction of the first segment of the subclavian artery. This was undertaken to complement the authors' consecutive cohort study of SCT performed on their own patients.

Searching
MEDLINE was searched from 1966 to September 2000 using the MeSH terms 'subclavian artery and carotid artery disease' with the textwords 'bypass' or 'transposition', or 'subclavian carotid transposition', 'carotid subclavian transposition', 'subclavian carotid bypass' or 'carotid subclavian bypass'. The reference lists of relevant and review articles, and the authors' personal files, were also searched.

Study selection
Study designs of evaluations included in the review
No designs were excluded. The studies did not have to compare the two interventions, just assess one or the other. Studies were excluded if there were fewer than five patients.

Specific interventions included in the review
The interventions included were elective CSBG or SCT of the first segment of the subclavian artery. The following interventions were excluded: carotid-to-contralateral subclavian revascularisation, extra-anatomic bypass grafting, isolated vertebral artery reconstruction, and revascularisation with endovascular techniques.

Participants included in the review
Patients with occlusive disease of the first segment of the subclavian artery. Patients were excluded if the indication for intervention was aneurysm, trauma, neoplastic disease or vascular malformation. The mean age of the patients in the included trials was 59 years, and 51 to 52% were male. The characteristics of the CSBG and SCT groups were (where reported) as follows: 78 and 62% of the patients, respectively, had a history of smoking; 46 and 42% had coronary artery disease; 51 and 47% had hypertension; and 14 and 8% had diabetes mellitus.

Outcomes assessed in the review
Studies that did not report the patency rate were excluded. Other outcomes were peri-operative mortality and morbidity, and clinical improvement as reported by the surgeon.

How were decisions on the relevance of primary studies made?
The studies were reviewed for relevance by two authors.

Assessment of study quality
Validity was assessed using pre-specified questions about the study design, documentation of patient demographics, description of the intervention and assessment of outcome. Two authors assessed the internal validity of the papers.

Data extraction
The data were extracted independently by two reviewers using a standardised form, and any disagreements were resolved by consensus between three reviewers.

The data extracted included: study design; the number of patients; patient selection; baseline characteristics; symptoms; surgical procedures; cointerventions; follow-up time; and outcome assessment (patency rates, complications, mortality).
Methods of synthesis
How were the studies combined?
A lack of statistically-significant heterogeneity was assumed. For each outcome, the sum of the total number of events was divided by the total number of patients for whom that outcome was reported, to give a pooled estimate of proportion weighted by study size. An associated 95% confidence interval (CI) was calculated. Chi-squared and Fisher exact tests were used to compare the pooled intervention effects.

How were differences between studies investigated?
Heterogeneity was not assessed or investigated.

Results of the review
Nineteen studies (n=1,027) were included: 7 studies compared the two interventions, 4 assessed SCT alone, 6 compared the two types of graft for CSBG, and 2 assessed synthetic graft CSBG alone. There were 511 SCT patients and 516 CSBG patients (76 with vein graft and 440 with synthetic graft). All of the included studies were retrospective and there were no randomised controlled trials. It was generally unclear whether consecutive patients were reported.

Fourteen studies adequately documented patient demographics and 11 adequately described the intervention.

The pooled cumulative patency rates were 99% (95% CI: 97, 100) for SCT at a mean follow-up of 61 (+/-15) months (range: 1 to 192), and 84% (95% CI: 80, 87) for CSBG at a mean follow-up of 58 (+/-18) months (range: 1 to 228). The difference in these rates was deemed statistically significant (chi-squared 69, p<0.0001).

The cumulative patency rates were 86% (95% CI: 83, 89) for CSBG with synthetic grafts at a mean follow-up of 58 (+/- 18) months (range: 1 to 228), and 74% (95% CI: 62,83) for CSBG with veins at a mean follow-up of 49 (+/- 9) months (range: 1 to 192). The difference in these rates was statistically significant (chi-squared 11.7, p=0.0006).

The pooled incidence of freedom from symptoms was 99% (95% CI: 98, 99) in the SCT group and 88% (95% CI: 88, 91) in the CSBG group, at a mean follow-up of 59 (+/-17) months (range: 1 to 228). The CSBG group had a higher incidence of early post-operative occlusions. The relative risk reduction of post-operative thrombosis was 74.6% for SCT compared with CSBG (absolute risk reduction 2.6%). There were no other statistically-significant differences in the pooled incidence of 30-day mortality, follow-up mortality or other complications.

Authors’ conclusions
The results suggested that the rates of patency and freedom from clinical symptoms were higher with SCT than with CSBG.

CRD commentary
The review question was clear. The literature search was not extensive, covering only one database and reference lists. It is possible that relevant studies were missed. As the authors point out, the quality of the available evidence is poor. There is a considerable risk of bias due to both the retrospective nature of the evidence and the lack of comparator groups in several studies.

The individual studies were not reported in sufficient detail. The details were confined to sample size, follow-up time and patency rate, and whether or not the demographics and interventions had been adequately described. The exact study designs were not reported, other than that they were retrospective. No description of the individual study populations was presented. The two intervention groups appear comparable where the characteristics are reported, but there are data missing on key characteristics in over 50% of the SCT group, leading to the possibility that patients selected for the interventions might differ systematically in their prognosis.

The study results for each type of CSBG were heterogeneous and no attempt was made to investigate the reasons for this; indeed, it was stated that the authors assumed a lack of heterogeneity. The statistical pooling methods were not described in full. Apparently, the authors did not use standard meta-analytic techniques but treated all the results as if
they came from one large study, rather than allowing for between-study variations arising from factors such as surgical skill. It would have been useful if the authors had conducted some sensitivity analyses, such as excluding those studies that did compare the two interventions, or those of CSBG with vein grafts.

Higher level evidence in the form of randomised controlled trials are often lacking in this type of intervention. The authors’ conclusions appear justified by the evidence they have identified, although there are methodological flaws in the analysis and acknowledged limitations in the evidence. These conclusions should be treated with caution, primarily due to the possibility of bias inherent in the primary studies. The authors state that the interpretation of the review's results is limited by the quality of the included studies.

**Implications of the review for practice and research**

**Practice:** The authors state that SCT is superior to CSBG in patency rate and long-term clinical improvement, and that it should be considered the intervention of choice in the practice of vascular surgeons who deal with occlusive disease of the first segment of the subclavian and vertebral arteries.

**Research:** The authors state that better quality evidence is required in the form of randomised controlled trials or well-conducted comparative studies with appropriate analyses that control for the patients' characteristics, in order to confirm or refute the review's findings.

**Bibliographic details**


**PubMedID**

11877687

**Other publications of related interest**

This additional published commentary may also be of interest. Ballotta E. Regarding 'Subclavian carotid transposition and bypass grafting: consecutive cohort study and systematic review'. J Vasc Surg 2002;36:426.

**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Aged; Arterial Occlusive Diseases /complications /surgery; Blood Vessel Prosthesis Implantation; Carotid Artery, Common /transplantation; Carotid Stenosis /complications /surgery; Cohort Studies; Endarterectomy, Carotid; Female; Follow-Up Studies; Humans; Incidence; Male; Middle Aged; Postoperative Complications /epidemiology /etiology; Recurrence; Reproducibility of Results; Retrospective Studies; Severity of Illness Index; Subclavian Artery /transplantation; Treatment Outcome; Vascular Patency /physiology

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the reliability of the review and the conclusions drawn.